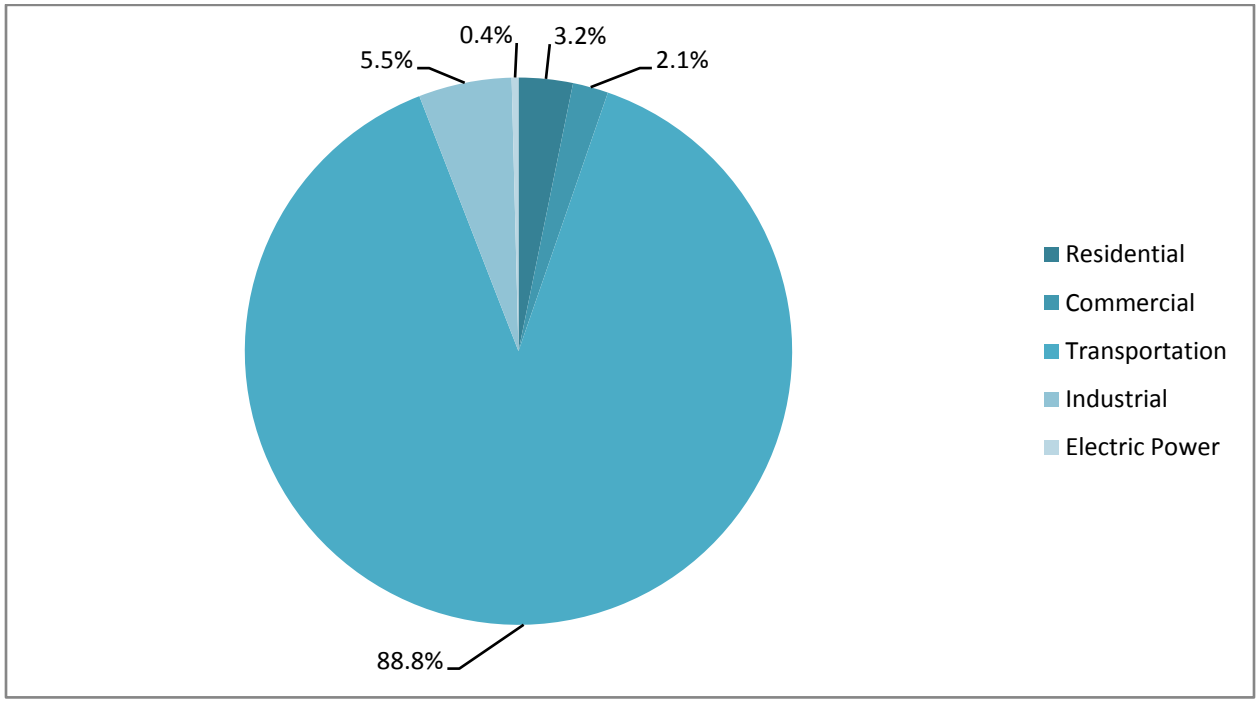
SECTION 7 - PETROLEUM

Petroleum is a broadly defined class of liquid hydrocarbon mixtures which includes crude oil, lease condensate, unfinished oils, refined products from the processing of crude oil, and natural gas plant liquids.

Petroleum Consumption

- Approximately 92.9 million barrels of motor gasoline, including ethanol blends, were used in 2012, which comprised 60.9 percent of the total petroleum usage for the year. Heating oil was the second largest use - approximately 34.3 million barrels or 21 percent of the total. Smaller amounts were used for aviation (16.9 million barrels or 11 percent) and residual fuel oil (1.9 million barrels or 1.3 percent), while propane accounted for the remainder of just over 3 percent or 4.8 million barrels

Figure 7-1: Petroleum Consumption in Virginia, 2012[1]



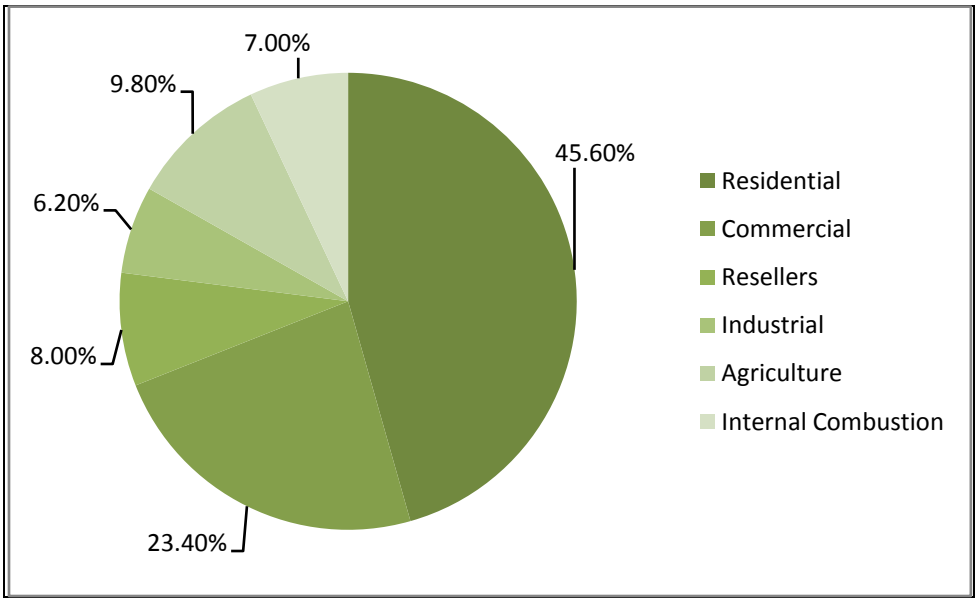
- Petroleum use in Virginia grew on average one percent per year from 1989 through 1998. Use has been stable since 1999 as vehicle miles traveled stabilized and the oldest, less fuel efficient vehicles were replaced by consumers

Petroleum is a broadly defined class of liquid hydrocarbon mixtures which includes crude oil, lease condensate, unfinished oils, refined products from the

[1] EIA, SEDS, www.eia.gov/state/seds/hf.jsp?incfile=sep_sum/plain_html/sum_use_tot.html, July 27, 2011.

- Propane is a normally gaseous straight-chain hydrocarbon and is a colorless gas that is extracted from natural gas or refinery gas streams

Figure 7-2: Propane Consumption Virginia, 2012[2]

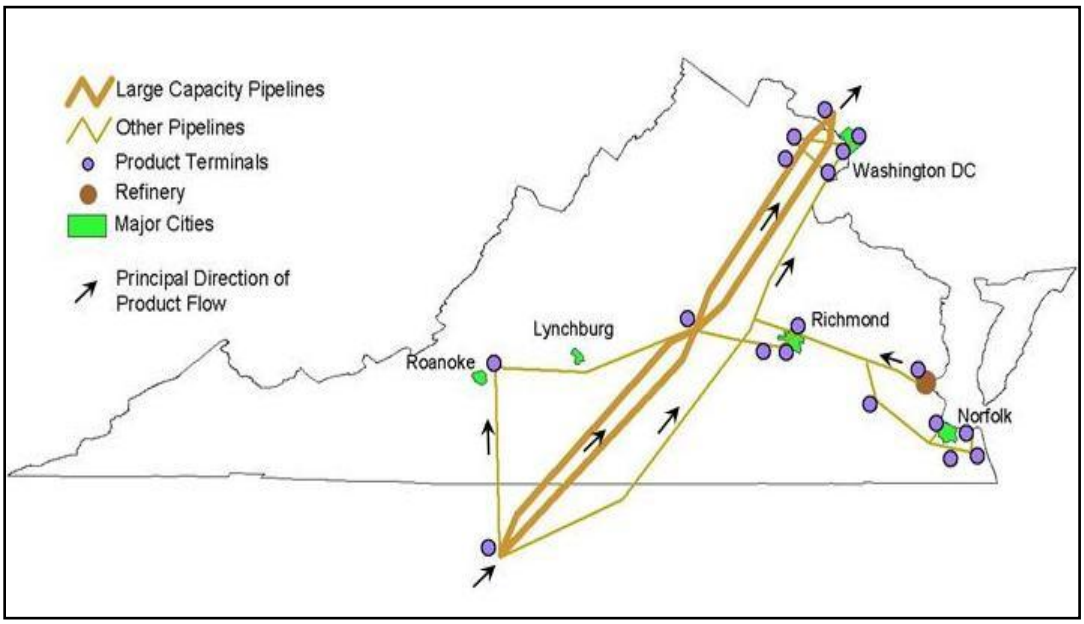


Petroleum Product Infrastructure

- Petroleum is supplied to Virginia through a network of refineries, pipelines, port facilities, terminals, and retail outlets
  - Finished petroleum products are shipped to petroleum terminals across Virginia in various ways:
    - The Colonial and Plantation underground pipelines deliver product from refineries in the Gulf of Mexico region to distribution terminals in Fairfax, Richmond, Montvale/Roanoke, and Chesapeake
    - Tankers and barges deliver product to coastal petroleum distribution terminals in Chesapeake and Richmond
  - Virginia consumers are also regularly supplied from out-of-state petroleum terminals in Baltimore, MD; Greensboro, NC; and Knoxville, TN.

[2] Propane Council, Propane Database and Forecasting Model, v.7.2

Figure 7-3: Major Petroleum Pipelines and Terminals in Virginia[3]

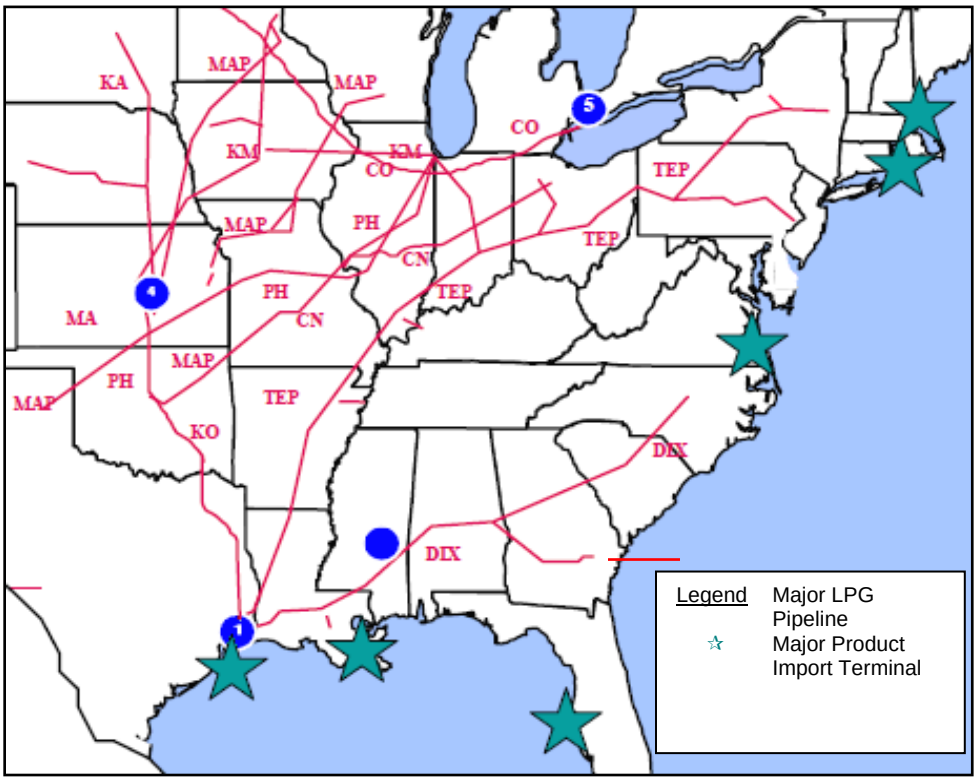


- Petroleum distributors, also called jobbers, purchase gasoline, diesel, heating oil, and other products from central terminals and truck them directly to large users, gas stations, and other retailers. Most jobbers also store gasoline, diesel, fuel oil, kerosene, lubricants, and other petroleum products in smaller storage facilities located in nearly every locality across Virginia

- The petroleum product supply chain has limited ability to respond to delivery disruptions such as from storms, pipeline problems, or panic buying runs. On average, there is a larger volume of empty capacity in vehicle gas tanks than there is in the entire fuel delivery system which results in shortages when motorist try to top off gas tanks in a perceived emergency
- The majority of Virginia's propane gas is supplied by the interstate propane pipeline terminating in Apex, North Carolina, and the water-based terminal in Chesapeake
- Propane is trucked from the North Carolina and Chesapeake terminals to bulk plants, and then distributed to end users

[3]Virginia Energy Patterns and Trends: Major Petroleum Product Pipelines, www.energy.vt.edu/vept/petroleum/oil_pipeline.asp The Yorktown refinery featured on this map is currently not operational.

Figure 7-4: Propane Pipelines and Major Terminals[4]



Petroleum Prices

- Petroleum price and availability are affected more by national and international policies and events than from in-state factors. These include
  - Political instability in oil producing countries
  - Drops in productivity in some oil producing regions
  - Effects of weather such as Gulf of Mexico hurricanes
  - Growth in demand in international markets such as China, India, Central America, and the Middle East
- Gasoline prices have been volatile over time, increasing to $4.04 in June 2008 and dropping to $2.51/gallon 15 months later in September 2009[5]
- Gasoline prices trended higher from year to year until 2009 when they declined. In 2010 and 2011, prices averaged $2.86 and $3.83/gallon, respectively. Seasonal adjustments combined with unplanned hikes due to severe weather events and unrest in the Middle East combine to create a volatile market with often sharp spikes in pricing

[4] Harry Hunter Hanger, Jr., Atlantic Energy Import Terminal, Presentation to the Pennsylvania Public Utility Commission Winter Meeting, November 9, 2006
[5] EIA, Petroleum Navigator, http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=mg_tt_1c&f=m, June 29, 2010

Table 7-1: Gasoline Prices, 1993-2011[6]

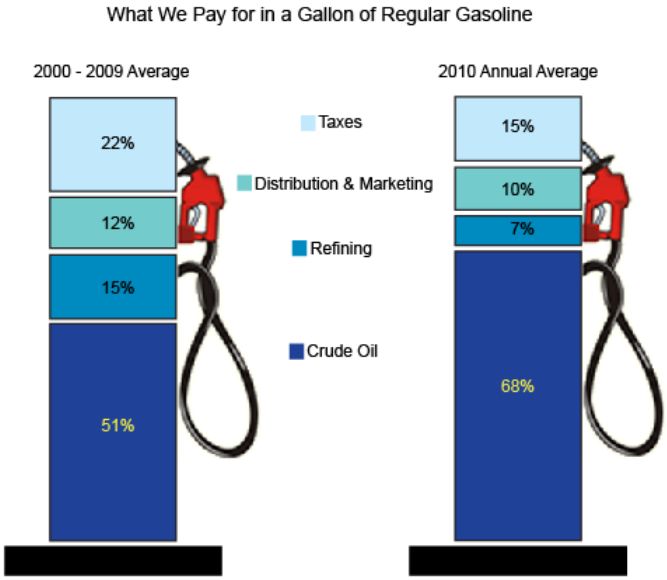
Year	Average Retail Gasoline – Price per Gallon (Including Federal and State Gasoline Taxes)
2000	$1.52
2001	$1.46
2002	$1.39
2003	$1.60
2004	$1.90
2005	$2.31
2006	$2.62
2007	$2.84
2008	$3.30
2009	$2.41
2010	$2.84
2011	$3.58
2012	$3.68
2013	$3.58

- The Energy Information Administration (EIA) predicts that petroleum prices will rise over the next ten years,[7] with annual refined petroleum prices paid for a product or service at the time of the transaction to increase from $2.69/gallon (including taxes) in 2010 to $4.12/gallon by 2020

- Petroleum product prices are also affected by changes in delivered input costs
    - Crude oil prices were about $68/barrel in 2007, accounting for 58 percent of the $2.80/gallon regular grade gasoline price; $100/barrel in 2008, accounting for 69 percent of the $3.25/gallon price; $62/barrel in 2009, accounting for 61 percent of the $2.34/gallon price; $79.40/ barrel in 2010 and $101.91/barrel in 2011 accounting for a 28.8 percent increase in consumer price over the previous years[8]

[6] EIA, Petroleum Navigator http://www.eia.gov/forecasts/steo/,
[7] EIA, Gasoline Prices by Formulation, Virginia, Sales to End Users, Average Through Retail Outlets, http://www.eia.doe.gov/dnav/pet/hist/LeafHandler.ashx?n=pet&s=d100613512&f=m, June 1, 2010
[8] EIA, A Primer on Gasoline Prices, http://www.eia.doe.gov/bookshelf/brochures/gasolinepricesprimer/index.html, July 18, 2014

Figure 7-5



Source: U.S. Energy Information Administration

- Propane prices (residential) have been less prone to dramatic increases than petroleum prices, ranging from $3.09/gallon in October 2008, $2.27 in October 2009, and $2.12/gallon in 2010. Annual prices are projected to increase to $3.17 in 2020

Table 7-2: US Residential Propane Price[9]

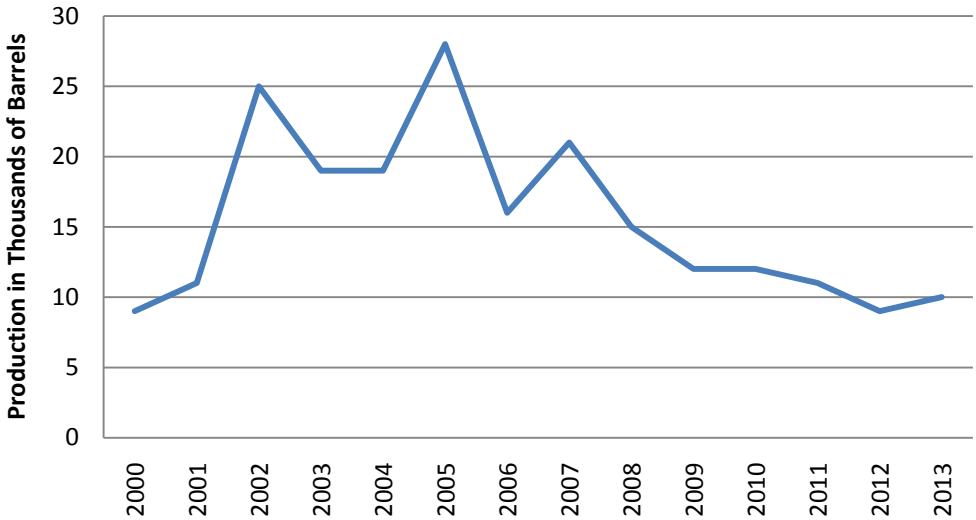
Year	Residential Price
2009	$2.22
2010	$2.48
2011	$2.68
2012	$2.47
2013	$2.41

Petroleum Production

- Virginia's oil and gas operators produced 11,508 barrels of oil in 2010 from wells located in Lee, Wise, and Russell Counties, equivalent to less than one percent of the state's annual consumption. This production is typically shipped to refineries in Kentucky for processing.

[9] EIA, East Coast (PADD1) Propane Residential Price, http://tonto.eia.doe.gov/dnav/pet/hist_xls/MPRREP14m.xls, June 23, 2010

Figure 7-6: Petroleum Production in Virginia, 1980–2010[10]



Offshore Oil

- There is an estimated 4.72 billion barrels of technically recoverable oil and 37.51 trillion cubic feet of technically recoverable natural gas in federal waters in the Atlantic Outer Continental Shelf[11]
    - The ultimate value of these reserves will depend on the actual amount of recoverable resources and the cost of oil
- Offshore oil production would support infrastructure expansion in Hampton Roads, attracting new business and creating jobs in the supply chain and for exploration and production
- Developing offshore oil resources is dependent on an extensive federal lease sale and permitting process

[10] Data from the Department of Mines, Minerals and Energy's Division of Gas and Oil
[11] http://www.boem.gov/Assessment-of-Oil-and-Gas-Resources-2014-Update/